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Transporting Isowean Pigs—Part I: Responses to Potential Intransit Nutritional Conditions

Hongwei Xin
Iowa State University, hxin@iastate.edu

Jay D. Harmon
Iowa State University, jharmon@iastate.edu

D.L. (Hank) Harris
Iowa State University

R. C. Ewan
Iowa State University

M. L. Gramer
Pig Improvement Company

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Abstract
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Transporting Isowean Pigs – Part I: Responses to Potential In-transit Nutritional Conditions

H. Xin,[1] J.D. Harmon, associate professors, Department of Agricultural and Biosystems Engineering; D.L. Hank Harris, Professor, Departments of Microbiology and Veterinary Diagnostic and Production Animal Medicine; R.C. Ewan, Professor, Department of Animal Science; M.L. Gramer, Pig Improvement Company (PIC)–USA, Franklin, KY

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Summary and Implications

The goal of this research effort was to explore the feasibility and protocols to transport isowean pigs long distance. This study was the first part of the effort that examined the nutritional aspects of such a practice. Isowean pigs of PIC genetics (8 to 12 days old, weighing 8 to 9 lb) were subjected to four post-weaning nutrition regimens that lasted for a simulated transportation duration of 72 h at a constant thermoneutral condition. The four nutrition regimens tested ranged from supply of feed and water supplement to absence of both feed and water. Pigs deprived of feed and water had a greater weight loss than the fed pigs or pigs supplied with water only (17 vs. 11% of initial body weight, $P<0.05$). The deprived pigs also had higher blood urea nitrogen (BUN) level than other pigs ($P<0.05$). All the treatments led to a significant rise in BUN but fall in blood glucose ($P<0.05$). But the glucose levels were much higher than the generally considered hypoglycemic level (75 mg/dl). All pigs showed a similar degree of dehydration, as evidenced by elevated hematocrit and blood electrolyte concentrations ($P<0.05$). The physiological responses returned to normal states during a 14-day subsequent growth period and were similar for all the pigs. The results suggest that isowean pigs coped well with post-weaning nutritional conditions that may be encountered for extended shipments. In-transit supply of feed would have little benefit to the pigs and hence can be excluded. However, availability of bacteria-resistant water supplement could prove beneficial in reducing stress of the pigs. This would particularly be the case when warm climate and/or low moisture content in the air are expected.

[1] Corresponding author: 203 Davidson Hall, Iowa State University, Ames, IA 50011. E-mail: hxin@iastate.edu

Introduction

The increasing global demand for U.S. breeder pigs calls for exploration of efficient delivery protocols. Such protocols are of particular importance for air shipments to Asia, where 36- to 72-h journeys are typical (11, 12). One potentially effective protocol is to export isowean pigs. Little information is available in the literature regarding the effects of post-weaning nutritional conditions on isowean pigs. In a classical study, Swiatek et al. (9) examined the effect of fasting on physiological responses of newborn pigs with emphasis on starvation hypoglycemia. They reported that 4-day-old and 1-, 2-, and 3-week-old pigs maintained normal blood glucose levels (>75 mg/dl) after 72 h of fasting. In another study, Gentz et al. (5) examined the metabolic and physiological effects of starvation for 4 to 5 days on neonatal pigs at birth to 16 days of age. They found that blood glucose level of newborn, 24-h-, 3-day-, and 9-day-old pigs all fell below 60 mg/dl after 72 h of fasting, but the 16-day-old pigs were able to maintain a glucose level greater than 80 mg/dl. These studies were conducted as alternatives to human experiments. Neither study reported pig performance following fasting. A few other studies have been reported concerning the effects of short-distance (<24 h) transportation of feeder pigs (7), short-term (24 h) fasting of newborn pigs (4), or prolonged fasting of growing pigs (8). The goal of this project was to explore the feasibility of shipping 10- to 12-day-old pigs overseas. As a first step, this study was conducted to quantify the energetic, physiological, and performance responses of isowean pigs to potential post-weaning nutritional regimens during extended overseas shipments. Although fluctuating thermal conditions are more typical of the in-transit environment (12), constant, thermal comfort conditions were chosen in this study to avoid potential interference of thermal conditions with the nutritional effects.

Materials and Methods

Isowean pigs and nutrition regimens

Three trials were conducted in this study. For each trial, 60 isowean pigs (PIC breed) were transported by truck from a breeder farm in Wisconsin to the Livestock Environment and Animal Physiology (LEAP) Research Lab of Iowa State University, Ames, Iowa. Upon arrival, the pigs were weighed and randomly assigned, in 15-pig groups, to four environmentally controlled calorimeter chambers (5 ft by 6 ft floor area each). Efforts were made to equalize the average initial body weight (IBW) among the chambers. Each chamber contained a specific nutrition regimen that lasted for 72 h, a duration that had frequently been encountered during shipment of poultry breeding stock to Asia (12). The four regimens tested included 1) feed (1 lb/pig) and Aqua-Jel®[2] water replacement (AJ) (2 lb/pig), denoted as *FAJ*; 2) AJ only (2 lb/pig), denoted as *AJ*; 3) AJ mixed with BlueLite® electrolytes supplement (0.125% by weight) (2 lb/pig), denoted as *AJBL*; and 4) no feed or AJ, denoted as *Fast*.

During the treatment period, rigid insulation board (1 inch thick, R=5 $ft^2 \cdot °F \cdot hr \cdot BTU^{-1}$) and woodshavings (2 to 3 inches in depth) were used for the floor and bedding of the calorimeter chambers, as would be used during the commercial shipments. Air temperature at the pig level was maintained at 80 ± 1°F with a concomitant relative humidity (RH) of 28 to 33%. Air draft at the pig level was less than 30 ft/min. Darkness was imposed during the treatment to simulate transportation situation, except that a red light was used to observe the pigs.

Following the 72-h treatment was a 14-day, ad libitum feeding growth period during which the pigs were on plastic coated expanded metal (TenderNova®) floor. Thermoneutral temperature near the pig level, determined by observing the postural behavior of the pigs, was maintained at 84 ± 1°F during the first week and 82 ± 1°F during the second week. The concomitant RH during this period ranged from 35 to 50%. Lighting was continuous at 27 lux intensity for the first 2 days of growth period and 12L:12D (12 h light and 12 h dark per day) thereafter. At the end of each week, the pull-plug manure pits were emptied, refilled with clean water, and the chambers cleaned to maintain good air quality inside the calorimeters.

Upon switching the pigs from treatment to growth phase, they were allowed about 1 h to access drinking water. Feed was then introduced. To prevent excessive eating, a limited amount of feed was initially provided, namely, 2.2 lb/pen to the *FAJ*, *AJ*, and *AJBL* pigs and 1.1 lb/pen to the *Fast* pigs. About 3 h later, another 1.1 lb of feed was added to the *Fast* pigs. Thereafter, feed was added every 4 h during the first 2 days (except for nighttime), followed by less frequent but larger quantities of feed addition. Two types of commercial starter diets procured from a local feed company[3] were used: Vigortone SEW 50® (1.4 lb/pig on average) and CIF 9/12® (remaining amount). Nutritional compositions of the diets are listed in Table 1. ME content was 1,538 kcal/lb for the Vigortone diet and 1,586 kcal/lb for the CIF9/12 diet.

Measurement and analysis of response variables

The following response variables of the pigs were monitored at the onset and end of the treatment and at the end of the growth period: body weight (BW), serum protein, hematocrit, blood urea nitrogen (BUN), blood glucose, and concentrations of blood electrolytes (Na^+, K^+, Cl^-, and HCO_2^-). Whole blood (2 ml/pig) and serum (3 ml/pig) samples were obtained by a skilled veterinarian from five randomly chosen pigs of each regimen during each trial. The blood samples were obtained using vacuum type needles, hubs, and tubes. The pigs were held by the forelegs with their heads down and their dorsum against the handler. With the neck extended by pressure on the lower jaw, the needle (22 gauge, 2.5 cm for pigs less than 7 kg or 20 gauge, 3.8 cm for larger pigs) was inserted slightly lateral and rostral to the manubrium sterni, in the hollow formed by the deepest portion of the right jugular fossa. The needle entered at approximately 90-degree angle to the skin and was directed slightly medially. Upon insertion, the tube was slipped onto the hub and the needle advanced slowly to its full depth, if necessary. Oftentimes, blood was obtained as the needle was slowly withdrawn, if not, then the angle or depth was adjusted. The left side of the neck could be used without serious side effects if necessary. Once collected, the samples were delivered to the ISU Animal Pathology Laboratory for analysis.

Total heat production rate (THP) and respiratory quotient (RQ) of the pigs were continuously measured at 30-min intervals by indirect calorimetry. Concurrent with the THP measurement were the moisture production rate (MP) and sensible heat production rate (SHP) by the pigs and their environment. The average specific THP, MP, and SHP were obtained by dividing the magnitude of each respective variable for the entire calorimeter by the total BW of pigs in the calorimeter at the given time. Detailed description of the Iowa State indirect calorimeter system can be found in a separate publication (10). Weekly feed intake and feed conversion (FC) during the growth period, mortality, morbidity, and behavior of the pigs also were measured or recorded.

The response variables were subjected to analysis of variance and multiple means comparison with a complete randomized block design.

Results and Discussion

Effects of the nutrition regimens on BW and FC

Average BW for the regimens at various stages of the experiment is summarized in Table 2. The *Fast* pigs had greater BW loss (BWL), averaging 1.34 lb/pig or 17% of the initial BW (IBW), than the other pigs ($P<0.05$). This BWL coincided with the 18% BWL from a 72-hr fasting as reported by Swiatek et al. (9) for 9-day-old pigs with an IBW of 5.23 lb. The extra BWL of the *Fast* pigs was not totally compensated for during the 2-week growth period. The *FAJ* pigs, compared with the *AJ* or *AJBL* pigs, did not show additional benefit from the feed supplied during the treatment period. However, the *FAJ* pigs did show a somewhat (6 to 7%) improved

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[2] Aqua-Jel® is a commercial water replacement and it had been proven to be an effective water supplement for breeder chicks exported overseas (11).
[3] Central Iowa Feed, State Center, IA.

weight gain compared with the *AJ* or *AJBL* pigs during the 2-week growth period. The overall FC during the 2-week growth period for the *FAJ*, *AJ*, *AJBL*, and *Fast* regimens was 1.03, 1.05, 1.12, and 1.08, respectively, with no statistical significance among the regimens ($P>0.05$). The 2-week cumulative FC (1.07 on average) for these pigs weaned at 8 to 12 days of age was better than FC for pigs weaned at 13 to 16 days of age (1.21 on average) as reported by Harmon et al. (6), although rehydration of the pigs following the treatment could have contributed to the weight gain in the current study that would normally be achieved by ingestion of feed rather than water.

Pigs in all regimens, following the 72 h treatment, were actively involved in drinking water once it became accessible. To alleviate the aggressive behavior in competing for the nipple drinkers, a shallow pan of water was placed on the floor to provide an additional water source.

Effects of the nutritional regimens on physiological responses

The results of blood analysis at the three points in the trial are summarized in Table 3. During the 72-h treatment period, the concentrations of plasma protein, hematocrit, BUN, sodium, potassium, chloride, and bicarbonate all increased, but the concentration of glucose decreased. With the exception of BUN and glucose, the increase during the treatment was probably an effect of dehydration. The marked increase in BUN concentration is an indication that the pigs were degrading protein to supply energy to meet the daily energy needs and offset the decline in glucose concentration. The trend of declined blood glucose levels paralleled that of the study by Gentz et al. (5) for newborn to 16-d old pigs. At the same time, results of the current study differed from those of Gentz et al. (5) in that the glucose content was much higher than the generally considered hypoglycemic level of 75 mg/dl (9), whereas glucose contents of pigs less than 9 days of age used by Gentz et al. (5) were all below 60 mg/dl after 72-h fasting. Glucose levels of the current study coincided more with those reported by Swiatek et al. (9) for 1-week-old pigs fasted for 72 h. The blood concentrations generally returned to normal levels during the subsequent growth period. For most measures, the nutritional supplements imposed during the 72-h treatment period reduced the magnitude of the change during this period but there was no clear effect that would suggest one regimen was better than another. These physiological results coincide with those of the growth performance as discussed above.

Effects of the nutritional regimens on energetic responses

Average THP, MP, SHP, and RQ during the treatment and growth periods are summarized in Table 4. During the treatment, pigs subjected to *FAJ*, *AJ*, and *AJBL* regimens had somewhat higher THP than the *Fast* pigs. This outcome agreed with the higher BUN level of the *Fast* pigs for the same period. THP of the group-housed *Fast* pigs in the current study, an equivalent O_2 consumption of 9.8 ml/[kg-min], was considerably lower than that of individually caged, 9-day old pigs, 13.1 ml/[kg-min] O_2 consumption, as found by Gentz et al. (1970). THP on the 3rd day for the *Fast* pigs, 3.27 W/kg or 89 kcal/[kg$^{0.75}$-d], agreed well with the fasting THP of 91 kcal/[kg$^{0.75}$-d] reported by Close and Mount (3) for fasting growing pigs at 30°C.

The most drastic difference between the *Fast* regimen and the other three was the lower MP for the *Fast* regimen ($P<0.05$). This result was expected since evaporation of the AJ in the *FAJ*, *AJ*, and *AJBL* regimens would add to the MP of the environment. Evaporation of AJ converted part of the SHP to MP, which explains the lower SHP for the *FAJ*, *AJ*, and *AJBL* regimens. The RQ values (0.83 ~ 0.87) indicate that the pigs were primarily metabolizing protein (RQ=0.81) and glucose (RQ=1.0). This is consistent with the results of elevated BUN and reduced glucose levels in the blood.

During the growth period, all the pigs shared similar energetic characteristics, and hence averages of the regimens were computed (Table 4). The average THP, MP, SHP, and RQ for the current study compared well with those measured in a previous study on the energetics of SEW pigs at different constant temperatures from our laboratory (Harmon et al., 1997). Specifically, THP, MP, SHP, and RQ of pigs weighing 11.7 lb (5.3 kg) (5-day average) at an air temperature of 84°F were 5.3, 3.7, 2.8, and 1.00, respectively, in the current study, as compared with 5.2, 4.6, 2.1, and 0.94, respectively, for pigs of same BW at air temperature of 86°F in the previous study. Similarly, THP, MP, SHP, and RQ of pigs weighing 16.5 lb (7.5 kg) at air temperature of 82°F averaged 5.6, 3.9, 2.9, and 1.02, respectively, in the current study, as compared with 5.7, 4.3, 2.6, and 0.97, respectively, for pigs weighing 16.7 lb (7.6 kg) at the same air temperature in the previous study. The heat and moisture production data obtained in the current study further confirmed the higher THP and MP by modern young pigs and their housing system as compared to those used in the literature (1) for design and operation of building ventilation systems. These data provide a fundamental basis for design and operation of environmental control systems for both transportation and production of isowean pigs.

Belly Nosing (BN) behavior, mortality, and morbidity

Some pigs, especially the smaller-size pigs, in all treatment groups were noticed to initiate and engage in various degrees of BN during the growth period. This behavior generally started within the first 2 days of the growth period. The intensity of BN tended to increase with time initially and then gradually decreased. There were a few cases of an enlarged navel as a result of this behavior. There was no indication that the BN behavior was related to certain post-weaning nutritional treatment. Borgman et al. (2) stated that BN was aesthetically annoying but did not seem to be detrimental to the performance of the pigs. They further reported that the most rapidly growing pigs were the most attacked targets.

No mortality occurred in any trial. Two morbid pigs in *AJBL* regimen and one in *AJ* regimen were culled during the first-week growth in trial 1. Diagnostic examination revealed starvation. For trials 2 and 3, one morbid pig in the *Fast* group was culled for each trial. These morbid pigs, though still fairly lively, were loosing or barely maintaining their BW during the first week of growth.

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Table 1. Nutritional compositions of the commercial starter diets used in the experiment.

Composition	**Diet:** *Vigortone*	**Diet:** *CIF 9/12*
Active Drug Ingredient		
Carbadox	0.0055%	0.0055%
Guaranteed Analysis		
Crude protein, min	24.00%	21.00%
Lysine, min	1.90%	1.80%
Methionine, min	0.50%	
Crude fat, min	9.50%	8.00%
Crude fiber, max	2.00%	3.00%
Calcium (Ca), min	0.90%	1.00%
Calcium (Ca), max	1.40%	1.50%
Phosphorus (P), min	0.90%	0.90%
Salt (NaCl), min	0.90%	0.25%
Salt (NaCl), max	1.40%	0.75%
Selenium (Se), min [ppm]	0.3	0.3
Zinc (Zn), min [ppm]	250	175
Vitamin A, min [IU/kg]	17,600	13,200
Vitamin D_3,min [IU/kg]	3,080	2,640
Vitamin E, min [IU/kg]	220	125

Table 2. Body weight (BW, kg/pig) and its changes of isowean pigs as affected by 72-h post-weaning nutritional regimens (presented as mean [μ] and standard error [SE] of three replicates).

Regimen[#]		IBW[♣]	72h-BW	BWL[♣]	%IBW	1wk-BW	%IBW	2wk-BW	%IBW
			(lb/pig)		72 h	(lb/pig)	1 wk	(lb/pig)	2 wk
FAJ	μ	8.12	7.26[a]	0.86[a]	89[a]	11.73	145[a]	17.78	220[a]
	SE	0.22	0.04	0.20	2	0.31	2	0.51	4
AJ	μ	8.27	7.30[a]	0.97[a]	88[a]	11.46	140[a]	17.60	214[a,b]
	SE	0.26	0.15	0.15	2	0.48	1	0.75	5
AJBL	μ	8.29	7.39[a]	0.92[a]	89[a]	11.35	141[a]	17.67	213[a,b]
	SE	0.24	0.11	0.18	2	0.77	3	0.79	7
Fast	μ	8.14	6.80[b]	1.34[b]	83[b]	10.80	133[b]	16.72	207[b]
	SE	0.24	0.20	0.04	0	0.37	1	0.53	2

Column means with different superscripts were significantly different ($P<0.05$).

FAJ = feed & Aqua-Jel®; *AJ* = Aqua-Jel® only; *AJBL* = AJ mixed with BlueLite®; *Fast* = no feed or AJ.

♣IBW = initial body weight; BWL = body weight loss.

Table 3. Results of blood analysis of isowean pigs subjected to four post-weaning nutritional treatments for 72 h at three points in the trial period (mean and standard error *in italic*).

Trial Day	Treatment$^{\#}$ *FAJ*		*AJ*		*AJBL*		*Fast*		Avg.	
					Serum Protein, g/dl					
0	6.07	*0.10*	6.24	*0.03*	6.24	*0.03*	6.15	*0.05*	6.18^{a}	*0.04*
3	7.10^{x}	*0.13*	7.05^{x}	*0.05*	7.10^{x}	*0.01*	7.49^{y}	*0.08*	7.18^{b}	*0.10*
17	5.13	*0.05*	4.96	*0.03*	5.15	*0.06*	5.00	*0.05*	5.06^{c}	*0.05*
					Hematocrit, %					
0	35.8^{y}	*0.2*	$35.5^{x,y}$	*0.6*	$34.9^{x,y}$	*0.6*	33.5^{x}	*0.4*	34.9^{a}	*0.5*
3	41.0	*0.4*	41.4	*0.5*	41.3	*0.7*	40.1	*0.4*	40.9^{b}	*0.3*
17	$34.0^{x,y}$	*0.3*	$34.5^{x,y}$	*0.1*	35.7^{y}	*0.2*	32.9^{x}	*0.4*	34.3^{a}	*0.5*
					BUN, g/dl					
0	8.3	*0.6*	10.2	*0.4*	8.9	*0.2*	10.2	*0.6*	9.4^{a}	*0.4*
3	31.6^{y}	*0.9*	35.1^{x}	*0.4*	$33.9^{x,y}$	*0.7*	38.7^{z}	*0.9*	34.8^{b}	*1.4*
17	7.0	*0.3*	6.9	*0.4*	6.1	*0.3*	6.6	*0.4*	6.6^{c}	*0.3*
					Glucose, mg/dl					
0	$125.6^{x,y}$	*1.0*	120.7^{x}	*1.4*	130.7^{y}	*1.2*	122.4^{x}	*1.6*	124.8^{a}	*2.2*
3	$106.3^{x,y}$	*1.6*	100.9^{x}	*2.1*	110.2^{y}	*1.2*	$106.5^{x,y}$	*1.9*	106.0^{b}	*1.9*
17	122.5^{x}	*1.5*	122.2^{x}	*1.8*	132.4^{y}	*1.5*	123.6^{x}	*1.1*	125.2^{a}	*1.9*
					Sodium, meq/l					
0	140.9	*0.3*	141.3	*0.1*	140.2	*0.2*	140.9	*0.2*	140.8^{a}	*0.2*
3	148.4^{y}	*0.5*	146.2^{x}	*0.5*	$147.1^{x,y}$	*0.5*	156.5^{z}	*0.4*	149.5^{b}	*2.4*
17	138.1	*0.4*	138.5	*0.2*	138.2	*0.1*	138.6	*0.3*	138.4^{c}	*0.2*
					Potassium, meq/l					
0	4.83	*0.08*	4.57	*0.04*	4.73	*0.04*	4.62	*0.16*	4.69^{a}	*0.06*
3	5.17^{z}	*0.10*	4.62^{x}	*0.02*	$4.74^{x,y}$	*0.09*	$5.15^{y,z}$	*0.13*	4.92^{b}	*0.15*
17	5.40^{y}	*0.15*	5.04^{x}	*0.07*	5.23^{x}	*0.08*	4.87^{x}	*0.11*	5.14^{c}	*0.12*
					Chloride, meq/l					
0	$107.5^{x,y}$	*0.3*	106.1^{x}	*0.3*	$107.2^{x,y}$	*0.1*	107.8^{y}	*0.1*	107.2^{a}	*0.4*
3	115.9^{y}	*0.3*	111.6^{w}	*0.7*	114.3^{x}	*0.4*	124.0^{z}	*0.3*	116.5^{b}	*2.7*
17	103.6	*0.3*	103.4	*0.2*	103.0	*0.2*	103.9	*0.3*	103.4^{c}	*0.3*
					Bicarbonate, meq/l					
0	$23.6^{x,y}$	*0.4*	24.4^{x}	*0.3*	22.2^{y}	*0.2*	$23.3^{x,y}$	*0.2*	23.4^{a}	*0.5*
3	25.4^{y}	*0.3*	27.3^{x}	*0.5*	24.2^{y}	*0.6*	24.7^{y}	*0.4*	25.4^{b}	*0.7*
17	25.2	*0.3*	26.0	*0.4*	24.6	*0.4*	26.3	*0.4*	25.5^{b}	*0.3*

^{a,b,c} Means for days with different superscripts within a measure are significantly different (P<0.05).
^{w,x,y,z} Within day and measure, treatment means with different superscripts are significantly different (P<0.05).
\# *FAJ* = feed & Aqua-Jel®; *AJ* = Aqua-Jel® only; *AJBL* = AJ mixed with BlueLite®; *Fast* = no feed or AJ.

Table 4. Energetic responses of isowean pigs during the 72-h treatment and growth periods. MP data include moisture from both pigs and their surroundings (mean [μ] and standard error [SE]).

72 hr Treatment[#]		BW (kg/pig)	THP (W/kg)	MP (g/[kg-h])	SHP (W/kg)	RQ (VCO_2/VO_2)
		3-day Treatment Period (T_a = 26.7°C [80°F], woodshavings bedding)				
FAJ	μ	3.5	3.8	3.8[a]	1.2	0.87
	SE	0.1	0.1	0.2	0.1	0.03
AJ	μ	3.5	4.1	4.2[a]	1.2	0.85
	SE	0.1	0.2	0.4	0.2	0.01
AJBL	μ	3.6	3.9	4.0[a]	1.1	0.83
	SE	0.1	0.1	0.3	0.1	0.03
FAST	μ	3.4	3.6	2.4[b]	1.5	0.86
	SE	0.1	0.3	0.2	0.3	0.02
		First-week Growth (T_a = 29.0°C [84°F], plastic coated expanded metal floor)				
FAJ	μ	4.3	5.1	3.8	2.6	0.96[a]
	SE	0.1	0.2	0.1	0.1	0.03
AJ	μ	4.3	5.2	4.0	2.7	0.94[a,b]
	SE	0.1	0.3	0.2	0.1	0.01
AJBL	μ	4.3	5.2	3.9	2.5	0.93[a,b]
	SE	0.2	0.2	0.1	0.2	0.03
FAST	μ	4.0	5.3	3.9	2.5	0.90[b]
	SE	0.1	0.4	0.4	0.1	0.02
Avg.	μ	4.2	5.2	3.9	2.6	0.94
	SE	0.1	0.3	0.2	0.1	0.02
		Second-week Growth (T_a = 27.8°C [82°F], plastic coated expanded metal floor)				
FAJ	μ	6.7	5.3	3.6	2.8	1.03
	SE	0.2	0.3	0.2	0.1	0.04
AJ	μ	6.6	5.5	3.9	2.9	1.01
	SE	0.3	0.1	0.2	0.2	0.01
AJBL	μ	6.6	5.5	3.8	2.8	1.02
	SE	0.4	0.2	0.1	0.1	0.01
FAST	μ	6.3	5.6	3.8	2.8	1.03
	SE	0.2	0.4	0.2	0.3	0.02
Avg.	μ	6.5	5.5	3.8	2.8	1.02
	SE	0.3	0.3	0.2	0.2	0.02

Column means with different superscripts are significantly different ($P<0.05$).
FAJ = feed & Aqua-Jel®; *AJ* = Aqua-Jel® only; *AJBL* = AJ mixed with BlueLite®; *Fast* = no feed or AJ.